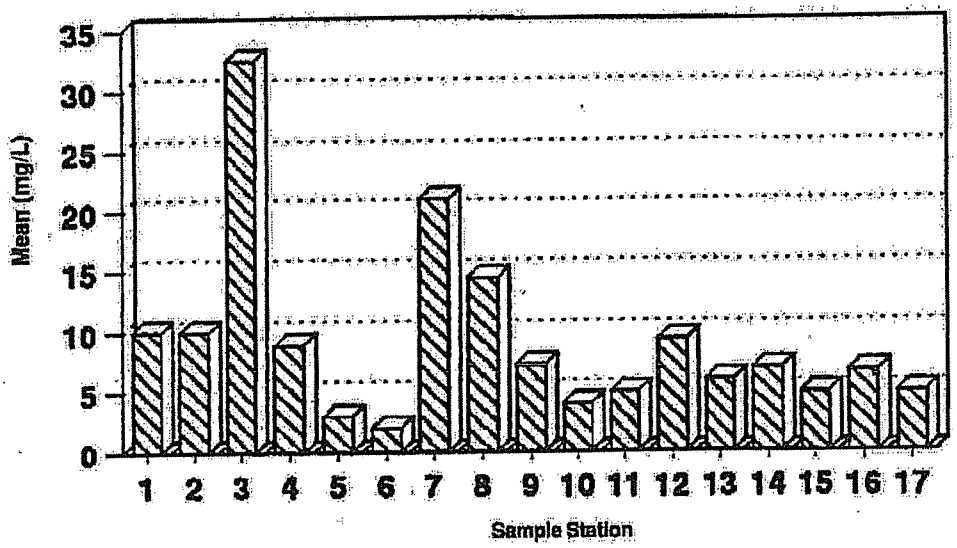

Figure 18. Dissolved solids concentrations in the Illinois River. Arkansas stream standard is 300 mg/L.

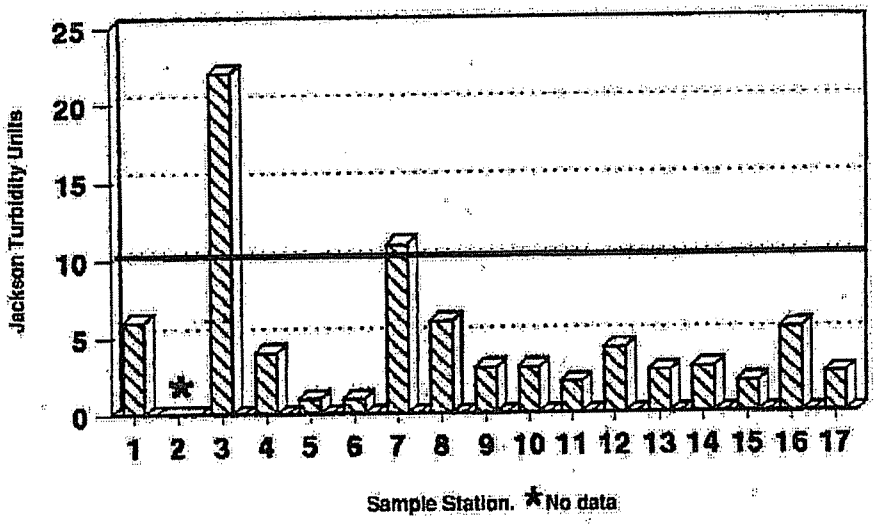

Figure 19. Turbidity values in the Illinois River Basin. Maximum stream standard 10 JTU (Arkansas).

Turbity values on Okalhoma staions averaged 11.4 JTU. The average median value was 4.25 JTU. Individual median values ranged from 11 JTU to 2 JTU. The tributary data were 2.15 JTU for a median value. Trends show an increase of over 19 JTU/yr (USEPA 1986).

A 1991 benthic study by Environmental Consulting Operations, Inc., evaluated five streams in Arkansas. Their findings were that the composite biometric scores showed substantial impairment of all of the sites tested. The composite biometric scores were Clear Creek (2.47), Little Osage Creek (2.25), Spring Creek (2.09), Upper Osage Creek (1.79), and Muddy Fork (1.80).

Biometric scores from 1.0 to 1.5 represent excessive impairment. Only pollution tolerant organisms are present. All biological parameters indicate an unacceptable level of change of the biological integrity and nonsupport of aquatic life uses. Scores from 1.6 to 2.5, which include all reaches tested in this survey, represent substantial impairment. This means that a major reduction in the abundance and taxa richness of pollution sensitive organisms has occurred. The biological integrity is threatened, and aquatic life uses are marginally or partly supported. Scores from 2.6 to 3.4 represent minimal impairment. Scores from 3.5 to 4.0 represent no impairment.

Legal and institutional concerns

Evidence of water quality problems and many of the pollution sources in the basin have been identified in the previous section. Developing and implementing solutions to these problems may be complicated because of the restraints inherent to the legal and institutional system we must work within. The following are some of these restraints as viewed by each state:

Arkansas institutional concerns

In Arkansas a complex legal and institutional framework exists, but through wholehearted cooperation, solutions to the many faceted water quality problems are vigorously being sought. Focused by the Governor's Task Force, State and Federal agencies and industry have joined together in developing solutions to the problems. State agencies include ASWCC, ADPC&E, Arkansas Department of Health, and universities. Federal agencies include SCS, ASCS, and CES. The groups are working together to overcome the inherent problems where a number of agencies with different missions and authorities work together. In the spirit of cooperation, voluntary and flexible approaches are being stressed. All are seeking new and more cost effective ways of managing animal waste produced in the Basin. These leaders do not believe that growth of the poultry and livestock industry are necessarily in conflict with the environment.

Oklahoma institutional concerns

Since 1989, Congress has provided Federal funding for several special water quality initiatives directed toward reducing nonpoint agriculture pollution. Funds for accomplishing these programs are administered through several Federal agencies and through grants directly to various State agencies. Some concern exists that the lack of interagency coordination among the different agencies will result in inefficient use of funds and manpower and in ineffective programs. The basis for this concern is that the current national directives for implementing water quality programs require interagency cooperation among many different Federal, State, and local agencies. For example, the Hydrologic Unit Projects are a cooperative effort among the USDA ASCS, CES, and SCS. Implementing the projects also involves close cooperation with the EPA, USFS, COE, and State agencies including the Animal and Forestry Division of the Department of Agriculture, State Department of Health, and others. Local county government agencies, conservation districts, and county committees are also involved in implementing the programs.

These many different agencies have varying degrees of water quality responsibilities, and many overlap and duplicate programs. Each agency or group has its own individuality with different program priorities and political influences. Contacting, communicating, and sharing information among responsible individuals in each agency can be a tremendous task. If the water quality programs are to be successful, agencies must change defensive attitudes toward protecting individual agency turf and work hard to develop an organized cooperative interagency approach for solving the water quality problems in the basin. Another concern that could prevent agencies from

achieving all of the goals of the nonpoint source programs is the possible lack of voluntary cooperation from the producers and operators responsible for the pollution sources. Some authorities feel that the voluntary approach may fail because a substantial number of operators and industries resist change, refuse assistance, do not recognize that there is a pollution problem, or do not have the financial resources to participate in the program. The success or failure of the current voluntary nonpoint source programs will depend entirely upon whether animal producers and related industries are willing to cooperate with the agencies and voluntarily implement better waste management and waste disposal practices. It will be a challenge to convince producers that they are partly responsible for the problems and that they should voluntarily spend their money on practices that have no obvious economic benefit to their operations.

Currently the State of Oklahoma does not require a permit for most confined feeding operations. Leaders in the State have been reluctant to pass strong regulatory legislation requiring the operators of agriculture nonpoint pollution sources to install water quality improvement practices because it might discourage economic growth. Oklahoma leaders seem reluctant to address the issue at all because there has not been a strong organized public concern about nonpoint pollution in the basin. If current voluntary programs are not successful in substantially reducing the pollution, the public may eventually insist on strict regulations for all potential pollution sources, but until then there will probably be little effective legislation passed to help encourage the reduction of nonpoint pollution in the basin.

Another restraint that could threaten success of the programs is the lack of flexibility in many Federal water quality financial assistance programs. Existing Federal cost share programs have established policies for determining eligibility. These policies are generally not very flexible. Most of the new proposed USDA water quality programs use existing ASCS cost share program procedures to help implement the programs. Accomplishing the goals of the new water quality programs will require new, innovative, and sometimes expensive practices. Established program procedures may not be flexible enough to allow cost share on some needed practices. All poultry operations need some type of waste holding and disposal facilities. These practices are relatively expensive and may not have obvious economic benefits. Current State regulations do not require these facilities. Many people feel that without cost share incentives, very few producers will voluntarily install basic pollution prevention practices. If the majority of these producers do not install the needed practices, little improvement will occur in water quality.

An overriding concern is that the cumulative effect of phosphorous and other nutrient loadings from the numerous point sources along the river could be high enough to cause the water quality degradation process in the river to continue. Ten municipalities and several other smaller facilities located along the river are permitted to discharge treated sewage effluent into the river. A 1986-87 report by W.W. Walker (1987) estimated that these facilities contributed 264,228 pounds of phosphorous to the river each year. This point source loading reportedly accounts for about half of the total phosphorous load in the Illinois River above Lake Tenkiller. Currently EPA does not limit or require monitoring of phosphorous in most municipal discharges, therefore these phosphorous loadings are continuing. Even if EPA does start limiting phosphorous, it may not solve the problem because of the method used to determine allowable discharge limits. The current permitting method sets discharge limits by evaluating the effects of the point discharge on a limited area of the stream. It ignores other downstream loading sources and does not consider the cumulative effect of all the phosphorus loads from point and nonpoint sources along the river. Therefore, the total phosphorous load in the Illinois River and Lake Tenkiller could continue to exceed eutrophication limits even if phosphorous loads from nonpoint sources are reduced. The only way to prevent this is to revise the discharge permitting system and determine allowable pollutant loads from municipal and other point source discharges by evaluating and accounting for the cumulative effect of all the contributing nutrient sources in the stream system.

One of the goals in most water quality program initiatives is to develop new and innovative practices that improve water quality. Developing new practices

and documenting that they are beneficial takes considerable money and time. Funds for research are very limited, and funding for developing new technology and new innovative practices is not provided for in most water quality proposal requests. Even if funds are found for research, developing the documentation of benefits may take many months or several years. It may be several years after documentation before a practice is accepted by agencies as a viable practice and determined eligible for cost share assistance. If new innovative practices are to be developed and used in the project areas, funds need to be available and the documentation and acceptance process needs to be more streamlined.

Another factor that could inhibit implementing the goals is the reluctance of some agencies to use new ideas and unproven methods and practices. Many practices that have been used for many years for erosion control work equally well in preventing displacement of nutrients into streams. These practices can be used immediately in water quality project areas with little or no modification. Other newly developed practices may not have obvious or direct benefits. Some agencies may not be flexible enough to accept the use of the practices without seeing the benefits proven in the field. As a result some needed practices may not be installed.

Ongoing activities

Research

Water quality and the many factors that affect it have been studied and scrutinized since humans first began to analyze their environment. Volumes have been written about how different mediums affect water quality and the ecosystems within lakes and streams. But surprisingly, there is still a lot about the water pollution process that is unknown or at least not fully understood, and acceptance of the basic facts that are known have been met with substantial controversy and scrutiny.

For example, information is available on the movement of nutrients in the soil, but most research studies have concentrated on nutrient deficiencies, not excessive nutrients. The knowledge about the effects of continuous high application of animal manure to the soil is limited. The data on how and in what form nutrients in manure are transported in surface runoff and through the soil profile are also limited. This information is urgently needed because it could be used to establish recommended timing and maximum application rates for animal waste and to determine what practices should be recommended to minimize displacement of waste and nutrients into watercourses. In an effort to obtain this information, several studies are underway, many of which are being conducted within the basin. The following is a summary of these studies.

- Southern Arkansas University is studying the feasibility of small scale methane digestion of swine litter. The methane will be used as fuel and the digested and nutrient stable waste will be land applied.

- The University of Arkansas Agronomy Department is conducting a multiple-year study to evaluate the effect of land applied animal wastes on ground and surface water. The data generated will be used to implement Best Management Practices for land application of poultry litter.

- The University of Arkansas Agronomy Department is also studying land application of composted chicken litter to delta rice soils. Initial results show increased rice yields with as low as 1 ton per acre of composted chicken litter. The yield increases are high enough to make compost application appear profitable.

- The ReLeaf Corporation in Mulberry, Arkansas, is conducting evaluations of their poultry litter compost product on different crops including rice, corn, and cotton. The objective of the evaluations is to show that the compost is a viable economical means of improving crop production on poor soils and on soils low in organic matter.

- Some poultry processing companies are conducting evaluations to determine efficient and economical ways to utilize poultry waste generated by their growers. Simmons Industries evaluation of dead bird composters and compost recipes has been instrumental in

helping improve SCS dead bird composter design and compost recipe recommendations. As a result SCS is able to provide all producers an effective, safe, and efficient method of disposing of dead birds.

- The Agriculture Research Service (ARS) in Durant, Oklahoma, is studying nutrient movement in typical Illinois River Basin soils that had animal waste applied for periods of 9 to 15 years. ARS has just released a preliminary report on the study. The study showed very little phosphoros accumulation in the subsoil and little potential for phosphorus to contribute to ground water pollution. The study did not state when the last manure application was made, but because very little nitrogen was found in the subsoil, potential movement of NO_3-N to ground water shortly after manure application is a possibility. The significant study conclusion was that after repeated applications of waste, sufficient soluble phosphorus accumulated near the soil surface to potentially increase the soluble phosphorus concentrations in runoff to levels great enough to stimulate an increase in biological growth in streams and lakes.

- Oklahoma SCS plant material specialists are developing plans for evaluating various vegetative filter strips effectiveness in removing nutrients in runoff from fields receiving animal waste.

- Oklahoma State University (OSU) Extension Service Engineering Department and the OSU Agronomy Department, with the help of a grant from the Oklahoma SCS, are conducting a study to determine the movement of waste, phosphorous, and other nutrients from fields with heavy applications of animal waste. The study is investigating nutrient and waste particle displacement by runoff from plots that have different waste application rates, soil types, slope, and ground cover. A rainfall simulator is being used to control rainfall intensity and runoff on the plots. Another parti of the study will examine waste and nutrient movement in the soil profile by applying waste to typical basin soil columns. No official results from the study have been released by researchers, but onsite observation of the collected samples and preliminary tests results indicate that a significant quantity of the applied litter and nutrients are being transported from the plots in runoff. SCS is seeking additional funds to expand the study to evaluate the effectiveness of different conservation practices on preventing waste particle displacement. The University of Arkansas at Fayetteville is conducting a similar study.

Developments

One of the major concerns in the Illinois River Basin is how to use the tremendous volume of chicken litter generated in the basin each year. Because the cost of transporting raw poultry litter is relatively high compared to the value of the nutrients it contains and the perceived danger of spreading pathogens during transport, most of the litter is currently being disposed of on fields near where it is produced. The composting process kills pathogens and dramatically reduces the volume of litter. Composting the litter and marketing it as a soil improvement is a promising alternative to the problems associated with spreading it over fields within the basin. Composted chicken litter could potentially be marketed into commercial channels and removed from the Illinois River Basin all together. Composting, necessary process for the successful marketing of a litter based fertilizer or soil amendment products, ensures product quality and stability and moderates objectionable odors. Litter, if composted, is a good soil amendment with some fertilizer value, but it has limitations including:

- Low nutrient analysis
- Some odor
- Low bulk density
- A narrow range of potential markets.

The key to using this alternative is developing a volume market for the product. The principle markets for compost are the lawn and garden market and the commercial agricultural market. Volume marketing of compost lies with horticultural and agricultural producers as they currently use the majority of commercial fertilizers. Compost can be marketed as is or pelleted and shipped in bulk to distributors or directly to farmers. A bagged product can be produced

for the lawn and garden market.

Currently at least two companies buy litter from poultry producers in the basin and compost it to sell in the commercial market. If these companies and others are successful in developing an agronomic market for the composted litter, it would benefit water quality by using large amounts of the poultry litter generated in the basin. It could also be a big economic benefit to the producers and other businesses in the area by developing a totally new market for the poultry litter.

The Arkansas Governor's Animal Waste Task Force in cooperation with the University of Arkansas and the Cooperative Extension Service are investigating the potential for using poultry litter as a cattle food supplement. Feed must be certified pathogen-free, consistently meet minimum nutritional guarantees and quality standards, and be competitive in the marketplace. Litter for feed should not be composted because it reduces feed value, but it should be pelleted and dried to meet pathogen requirements and to ensure stability. The addition of corn or similar products may be required to increase the amount of available energy. Results from the task force should be available in 1992.

Over 20 million poultry die each year in the basin. Disposing of these carcasses threatens water quality and is a potential health hazard. Until recently the options for disposing of these birds were not very satisfactory. The development of new composter designs and compost recipes have made composting an effective and economical alternative to other methods of disposal. More and more producers are using dead bird composters to dispose of the carcasses. Construction of dead bird composters generally includes a concrete pad and a four-sided building with removable sections. Composting proceeds after layers of straw, dead birds, and poultry manure or litter are loaded into the primary section of the composter. After primary decomposition, the material is mixed and moved into other sections for further decomposition. During the process the material heats up to about 150 degrees Farenheit, which kills fly larvae and pathogens. The end product is an odorless, nutrient-stable, plant fertilizer and soil amendment.

A buffer strip of vegetation along streams may be one of the most cost effective and beneficial ways to reduce pollutants entering streams. This practice will be emphasized in the special project areas in the basin. Forested buffer strips along streams prevent excess nutrients from entering waterways by slowing surface runoff and trapping nutrients. Surface runoff from forested soils is rare, occurring only when they are saturated. Consequently erosion rates from forest-lands are very low (less than 0.5 ton/acre/year). As nutrient rich runoff water enters the buffer strip, some nutrients are extracted by tree roots. Forest soils along a stream contain large amounts of organic matter, which facilitates nutrient retention. In the presence of moist soils that are high in organic matter, some of the soluble nitrogen contained in runoff water is denitrified and released into the atmosphere as a gas. The filtered water enters the stream through subsurface passage. Even narrow forested strips effectively filter runoff from adjacent cropland. A mere 50 foot strip between the pollution source and the stream, depending on site characteristics, can remove the majority of nitrogen and phosphorus from surface runoff.

In addition to improving water quality, buffer strips can provide recreational opportunity. Hunters will find game animals including deer, squirrel, woodcock, and wood duck in and around buffer strips. The variety of plants in buffer strips provide specific food and shelter requirements for these species. Buffer forests also provide excellent opportunities for nature studies of plants, animals, and fish. Because upland and stream ecosystems are within close proximity, these areas are particularly valuable for science classes, nature organizations, and outdoor clubs. Fishing along forested stretches can be superior to areas without a forest cover. Trees and shrubs along streambanks shade the stream and buffer temperature changes. Each aquatic species has an optimum temperature range in which it is adapted to live. Deviations in temperature range can have drastic effects on fish and aquatic insects upon which fish feed. Litter fall from trees and shrubs growing along the stream provide the primary energy base for most stream ecosystems. Areas without overhanging streambank vegetation cannot provide this energy source.

The primary pollution concerns in the basin are

municipal point and agriculture nonpoint pollution sources. EPA has the responsibility for regulating point sources. (Their regulations are addressed in other sections of this report.) Discussions in this section are limited to regulations that address nonpoint sources.

Many of the confined feeding operations in the basin are in areas that have historically been economically depressed. The poultry and swine industry growth has benefited the economy in these areas, and local community leaders and State leaders have encouraged this growth. The focus on water pollution in the basin has created concern among producers and officials that the public reaction could force regulatory agencies to adopt regulations that will increase production costs and discourage this growth.

Arkansas regulations.—In the Arkansas part of the basin, the ADPC&E serves as the regulatory agency for agricultural nonpoint source pollution. The ADPC&E issues permits to all swine, dairy, and poultry operations that handle their wastes in liquid form. These permits are issued on a no discharge basis in that wastes are to be handled in a way that minimizes pollution problems through land application of the waste. Wastes from confined animal operations are typically stored in holding facilities and land applied so that the nutrients contained in the waste water can be utilized by a crop. Periodic and random field inspections are done by ADPC&E inspectors.

Permits for liquid animal waste facilities are issued through the authority of Regulation number 5 of the ADPC&E. Regulation #5 was recently revised in an interagency, legislative, and public review and comment process as a part of the Governors Animal Waste Task Force. The revised regulation requires educational training for farm operators and a waste management plan that contains technical requirements for each permittee. These requirements include land application specifications, soil testing, recordkeeping, and waste analysis.

Permits for the generation and distribution of dry animal waste are not required, however, at least two versions of voluntary guidelines are in the draft stages. The ASWCC has proposed a Nonpoint Source Pollution Abatement Proposal. The poultry industries in Arkansas have formulated an Environmental Addendum. Both are in draft form and being reviewed. These documents provide the farmer with information concerning the safe land application of dry animal waste and disposal of dead birds. A recent poultry grower survey revealed that 82.6 percent of farmers would comply voluntarily with the environmental addendum prepared by the poultry industry.

Regulations governing the disposal of dead poultry carcasses are administered by the Arkansas Livestock and Poultry Commission. Approved methods of disposal are burial, composting, incineration, and freezer storage. Disposal by the concrete pit method has been discontinued as of this year because ground water from underneath some of these facilities has been found to contain excessive nitrates.

Confined animal operations that generate waste within public supply watersheds are reviewed by the Arkansas Department of Health. Objectionable substances including refuse, industrial wastes, or other objectionable substances may not be deposited in the watershed of a water supply without the written approval of the Arkansas Department of Health. The health department has four areas of concern:

- Nutrients entering public supply lakes in runoff from land application sites and feed or pasture lots.
- Contamination of unprotected aquifers, such as karst formations and fractured rock formations, with micro-organisms from land application of wastes or from feed or pasture lots.
- Contamination of aquifers with increased levels of nitrates from runoff and infiltration through land application of wastes or from feed or pasture lots.
- Disposal of carcasses of dead animals and nuisances associated with storage and disposal of carcasses and animal wastes.

Oklahoma regulations.—Several different State agencies share the responsibility of protecting the environment and surface and ground water supplies in the Oklahoma part of the basin. Although the agencies are given specific environmental responsibilities, it is

often difficult to make a clear distinction as to what agency is clearly responsible for a particular program.

The Oklahoma Pollution Control Coordinating Board (PCCB) with the Oklahoma Department of Pollution Control (ODPC) as its executive arm was designated the lead agency for the nonpoint source pollution control program. The board membership includes four appointed citizens and one representative from each of the seven agencies that have major natural resource responsibilities. These agencies include the Oklahoma Department of Health, Water Resources Board, Corporation Commission, Department of Agriculture, Conservation Commission, Department of Mines, Department of Wildlife Conservation. The PCCB and ODPC serve primarily as a coordinating body to facilitate cooperation among the seven PCCB agency members. The ODPC also coordinates a Pollution Complaint System, whereby any person may report pollution violations.

The Oklahoma State Department of Agriculture (OSDA) and the Oklahoma Conservation Commission (OCC) are the principal agencies responsible for agriculture nonpoint source pollution. Both have been active in developing programs to address pollution problems in the basin.

OCC was the primary agency responsible for preparing Oklahoma's 319 NPS Assessment Report and the 319 NPS Management Plan. The Illinois River Basin was identified in both reports as the State's top priority watershed to begin implementing NPS programs.

In response to the reports, the OCC developed a comprehensive Illinois River Watershed Implementation Program Plan. Objectives of this plan are included in the following section.

The Oklahoma State Department of Agriculture, Plant Industry and Consumer Services Division, regulates confined feeding operations in the basin except for dairies and fisheries, which are under the authority of the Oklahoma Feed Yard Act. The primary purpose of the Act is preventing ground and surface water pollution. The Act essentially requires the feeding operation to collect and maintain liquid and solid waste and wastewater on the property and provide for proper disposal of these materials to the extent technically and economically practical to protecting the environment. With the exception of dead bird disposal, few specific poultry waste disposal requirements are included in the regulations. Enforcement of the Act is accomplished by routine onsite inspections of the facilities and by responding to complaints. The current law provides a means of correcting pollution problems after they are discovered, but generally does not provide a means of preventing pollution problems by requiring a permit or license to operate most confined feeding operations. Generally, an animal facility is only required to be licensed if the operation is discharging liquid or solid waste into a stream.

The Oklahoma State Department of Health regulates dairies in the basin. In 1990 new dairy waste management regulations were implemented that require all dairies to develop and implement a waste management system. The system must address collection, handling, treatment, and disposal of waste and wastewater from all dairy feeding areas, holding lots, and milk parlors. The systems must be designed by the SCS or other qualified individuals. The regulations are being phased in over a 3-year period. Large dairies were to be in compliance by December 31, 1991, and dairies that have less than 50 cows have until December 31, 1993, to implement the plans.

Ongoing government programs

Water quality has become an important issue in America, and increasingly, public attention is focusing on nonpoint agricultural pollution. This interest has resulted in the funding of several special water quality programs to address nonpoint pollution. Many State, local, and Federal agencies in Arkansas and Oklahoma have developed strategies to use existing programs to evaluate and develop solutions for the problems in the Illinois River Basin. Many projects were started in 1990 and continue in the implementation phase today.

To help identify priority pollution problem areas, the basin was divided into smaller watersheds. These watersheds were inventoried for existing and potential pollution sources. They were prioritized according to the severity of the pollution. One of the objectives of the SCS Illinois River Basin Study is to prepare detailed reports on the watersheds in order of priority. These reports will be made available to any agency or

group to assist them in submitting proposals for water quality projects. Priority watersheds or groups of watersheds will be targeted for assistance as funds for projects become available. Initial projects will be used as demonstrations, and each will be evaluated to determine how effective they are in achieving goals. Experience gained from each will be used to improve future projects.

In 1991 the SCS in Oklahoma and Arkansas had three water quality projects in the Illinois River Basin. Oklahoma has two Hydrologic Unit Area (HUA) plans funded by the USDA and a Water Quality Demonstration Project (WDQP) funded by EPA and the Oklahoma Conservation Commission. The two HUA project plans target the Flint Creek watershed (Battle Branch Hydrologic Unit) in southern Delaware County and the Peacheater Creek watershed area in Adair County. The WQDP covers the Battle Branch Creek watershed in Delaware County.

In 1990, Arkansas received approval for the first HUA in Arkansas, which was named Moores Creek of the Illinois River. At the beginning of the second year, the project was expanded to include the entire Muddy Fork of the Illinois River. The Muddy Fork HUA has been operational for 3 years. The project concentrated on providing the farmer with a waste management plan, education and information, technical assistance, and financial assistance. The initial response from the farmers has been phenomenal with high participation. Almost 80 percent of the land within the watershed suitable for the spreading of animal waste has a waste management plan and is in the process of being implemented. Soils have been tested for nutrients, and some animal waste has been tested to verify application rate guidelines. Farmers have voluntarily installed almost 100 dead bird composters and many adjoining manure stacking sheds. The CES has collected or tested, or both, over 150 water quality samples from on-farm sites. The HUA project accompanied by ASCS Special Water Quality Projects in the Muddy Fork and the Illinois River Basin have changed the way animal waste is managed in the basin. Hopefully, water quality data being collected by the University of Arkansas in cooperation with the ASCC will show improvement within the next few years as a result of the voluntary efforts of area farmers.

The goal of HUA and demonstration projects is to provide accelerated technical, financial, and educational assistance within a targeted watershed area to help landowners voluntarily solve nonpoint source pollution problems. The projects are a cooperative effort among the SCS, ASCS, CES, State 319 agencies, and local conservation districts. SCS provides technical assistance in developing waste management plans and designing conservation practices on all projects. CES is the lead agency responsible for information and education programs. ASCS administers cost share funds on USDA funded projects, and 319 agencies administer funds from EPA on State projects. Water quality monitoring information is provided by 319 agencies.

In late 1991, Oklahoma and Arkansas State agencies received a special Federal appropriation to use for pollution abatement programs in the Illinois River Basin.

To help use Oklahoma's share of the funds more efficiently and effectively, the OCC developed a comprehensive "Illinois River Watershed Implementation Program Plan Proposal." This plan proposes to organize the many State, local, and Federal agencies with water quality responsibilities into a cooperative coalition to help solve pollution problems in the Oklahoma part of the basin.

The primary objective of the coalition will be to develop a comprehensive Illinois River Watershed Management Program for the basin. The plan includes provisions for development of cooperative interagency NPS pollution improvement demonstration projects and provides for water quality technical assistance, education, and monitoring programs. Each cooperating agency will be responsible for specific parts of the program related to their areas of expertise.

Preliminary interagency meetings have been held to develop the program. Plans have been formulated to make the Peacheater Creek HUA the first truly cooperative effort of the coalition. Funds from the appropriation will be administered through EPA and OCC. The funds will be used for added cost share incentives for water quality improvement practices and educational and informational programs in the Peacheater Creek Watershed. Cooperative projects will be developed for other watersheds in the basin if this initial effort is successful.

Recreational activities along the river are being adversely impacted by the pollution problems, but these activities are also being recognized as contributing to the problem. The Oklahoma Scenic Rivers Commission and other agencies are working with canoe rental operations and other recreational venders to help reduce this impact. The commission has already initiated a pollution education program, installed trash receptacles, implemented clean up programs, and is helping enforce laws designed to protect the river. Future plans include installing pollution free restrooms in camping areas, planting trees on riparian areas, and expanding their education and information program.

In Arkansas, coordination of nonpoint source abatement programs has been facilitated by the establishment of the Governor's Animal Waste Task Force. Many agencies, industry, and farmers share the authority and responsibility to correct nonpoint source water quality problems. The task force has become the focal point for all parties to share information and coordinate efforts. The USDA water quality initiative began with Water Quality Special Projects in 1985, followed by HUA Demonstration Projects in 1990. The State 319 agency received approval for their first management plan in 1991. Before the establishment of the task force, coordination was attempted through numerous committees, such as the USDA Water Quality Action Plan Committee. Nonpoint source programs expanded, and the degree of involvement from different agencies, farmers, industry, environmental groups, and the public in animal waste issues soared. The development of the task force brought together all parties with interest in the issues to be resolved. The task force formalized an organized approach to identify and quantify problem areas, develop plans to solve those problems, investigate innovative solutions, review ongoing programs, and evaluate the voluntary approach. The task force has been tremendously successful. Scores of innovative waste management products, conservation practices, and management options have been observed and evaluated. Regulation number 5 has been finalized and adopted by the State water quality management agency for the regulation of liquid animal waste. The animal industry and the State 319 agency have formulated voluntary guidelines for the land application of dry animal waste. However, greater efficiency of effort, reduced duplication of tasks, and improved communications have been the most significant accomplishments of the task force. The task force brought together on common ground, a highly diverse group with different views, interests, goals, and objectives and provided a vehicle whereby all could express their concerns and be heard. About 10 different water quality based State and Federal agency committees are still active today in the state, but the task force serves as the catalyst and association for cooperation and coordination of all nonpoint source abatement activities in Arkansas.

Water quality conservation practices

Any discussion of the practices recommended for prevention of water quality degradation should begin with a review of conservation practices developed by the SCS. These practices are listed in the current SCS Field Office Technical Guide. The Guide is available for review at any local SCS field office. SCS recently reviewed and amended all of the practices listed in the SCS standards and specifications to address water quality needs. Many of the practices were developed specifically for the prevention of water pollution. New practices and revisions of old practices may evolve during current studies. New specifications will be developed and approved as new technology becomes available. Specifications for other practices, such as rural residential waste systems (septic tanks), will be provided by appropriate State agencies.

Studies show the primary cause of degrading water quality in the Illinois River is the result of excessive nutrient loads. Nutrients in municipal sewage effluent accounts for a part of these nutrients. The nonpoint nutrient sources in the basin are the total confined and unconfined animal populations in the basin. Waste and nutrients can be transported in runoff and seepage from exposed manure piles, dairies, animal holding areas, and fields receiving applications of animal waste. This process of handling, disposal, and utilization of animal waste has the greatest potential for contributing to the nonpoint source nutrient problems. Improving techniques in handling, disposal, and use of the waste have the greatest potential of alleviating the problem. Therefore practices that improve the use and storage of animal waste should be priority practices in any plan to improve water quality in the basin.

Some practices that may be used in developing water quality farm plans include:

Agricultural conservation practices anticipated	SCS code	ASCS code
1. Drainage field ditch	607	--
2. Critical area planting	342	SL-11
3. Conservation cropping sequence	328	--
4. Conservation tillage	329	SL-14/15
5. Proper grazing use	528	--
6. Terrace	600/362	SL-4/5
7. Grassed waterway	412	WP-3
8. Grade stabilization structure	410	WP-1
9. Pest management	685	--
10. Structure for water control	587	WP-1
11. Field border	386	SL-1
12. Nutrient management	680	--
13. Pasture & hayland planting	512	SL-1
14. Stripcropping—contour	585	SL-1
15. Pond	378	SL-6
16. Spring development	574	SL-6
17. Sediment basin	350	WP-1
18. Irrigation water management	449	--
19. Fencing	382	WP-2/SL-6
20. Irrigation systems—sprinkler	442	--
21. Deferred grazing	352	--
22. Filter strip	393	WP-2
23. Roof runoff management	558	--
24. Dead poultry composting	312A	WP-4
25. Waste management system	312	--
26. Waste storage pond	425	WP-4
27. Waste storage structure	313	WP-4
28. Waste treatment lagoon	359	WP-4
29. Waste utilization	633	--
30. Diversions	362	SL-5
31. Pasture & hayland management	510	SL-2

Monitoring

Numerous Federal and State agencies have monitored the water and compiled water quality data in the Illinois River Basin. A continuing effort to collect more data is still underway.

Arkansas—The ASWCC and the CES have been monitoring the Muddy Fork HUA for about 2 years. The ASWCC is funding a program to sample and analyze data from four instrumented edge of field sites, two instrumented stream sites, and seven grab sample sites. The CES is collecting about 100 water quality samples per year from ponds, wells, springs, and streams and analyzing them for nitrates and phosphates. These monitoring programs should show the effects of nonpoint source program implementation if they are continued long enough for the hydrologic system to respond.

Oklahoma—The OCC water quality staff has been collecting water quality data in the Battle Branch and Peacheater watersheds for several years. In 1990, OCC began periodic sampling of most of the watersheds in the Oklahoma part of the basin. They plan to continue this sampling in the future. These data will be used to evaluate the success of the HUA and demonstration projects in the watersheds and will complement inventory and waste production data used to establish the highest priority subwatersheds and target special assistance programs.

Technical and financial assistance

In HUA's where water quality special projects have been approved, funding for up to 75 percent of the cost of installing beneficial practices is available through USDA. SCS provides technical assistance in developing plans and contracts, and ASCS administers the funds through local county ASCS committees. Over $300,000 in USDA funding was available for cost share in 1991 for the HUA project areas. ASCS provides cost share on a number of practices and structures that can directly reduce nonpoint pollution. Among these are dead bird composters, stacking sheds to store poultry litter, livestock exclusion from streams, pasture and hayland management plans, and waste management plans. Waste management plans provided by the SCS furnish the landowners and operators with guidelines to properly handle, store, and apply waste to cropland as fertilizer. The management plan includes loading rates that allow the crop to use all of the nutrients, follow-up soil sampling to determine future application rates, application times with respect to weather and soil conditions that minimize runoff, and allowances for buffer zones from streams, wells, and rock outcrops.

In the Battle Branch Demonstration Project, funding for cost share is provided by EPA and the State of Oklahoma. Up to 90 percent cost share is available to

producers to install conservation practices. SCS provides technical assistance in developing plans and contracts, and OCC administers the funds through the Delaware County Conservation District. Over $25,000 in EPA-State funds were available for cost share assistance in 1990-91 for the demonstration project area.

OCC received additional EPA and State funding for water quality programs in late 1991. They are planning more water quality demonstration projects that include cost share incentives. Plans are also being developed to use part of the funds to supplement cost share programs in HUA's. The OCC-EPA funds would increase rates on some practices up to 90 percent and add new eligible practices.

In the entire Illinois River Basin in Arkansas, the ASCS has provided 75 percent Federal / 25 percent local cost share funds to accelerate implementation of conservation practices. The SCS is delivering technical assistance through the expanded staffs in two county field offices supported by area and state office staffs. The ASWCC has provided an additional technician in Washington County to assist with the development of waste management plans. The CES is providing education, information, and technical assistance in the form of soil tests, manure tests, and economic evaluations for the farmer.

In all project areas, producers must develop a plan to address all water quality problems on their land to qualify for cost share assistance. Technical assistance in developing waste management and utilization plans, structural engineering, design-layout of waste holding structures, and other planning will be provided. All practices approved by SCS personnel in USDA projects must meet SCS Field Office Technical Guide. Some practices installed using State funds may be approved by State agencies.

Information and education

Success or failure of any efforts to correct and prevent pollution problems in the Illinois River Basin depends upon the cooperation of the producers within the basin. Where adequate information and economical alternatives are presented to people, they will respond voluntarily and help correct the problems. A strong education and information campaign is the cornerstone of the voluntary approach.

Arkansas and Oklahoma CES, SCS, ASCS, OCC, and ASWCC have initiated a cooperative water quality information program targeted for many of the watersheds in the Illinois River Basin. The programs include holding public meetings, preparing multimedia news-releases, developing TV feature programs, videotapes, and publishing a quarterly newsletter. These will be used to explain assistance programs and present programs on waste management, efficient fertilizer use, composting, and other water quality related topics. Demonstration sites are being developed to show proper animal manure application rates and timing. Other sites will demonstrate how soil type, slope, rainfall, and runoff affect nutrient and waste particle mobility and how their displacement results in water quality degradation.

The cooperative information program will be complemented by SCS, CES, and ASCS plans to increase their efforts to provide individual cooperators throughout the basin with water quality information and technical assistance.

Economic growth versus environmental protection

The Illinois River Basin, particularly in the Arkansas part, has been the economic bright spot of the region over the last decade. The solution to the current environmental problems, particularly the threat to ground and surface water supplies, is of paramount importance to the region. This goal of environmental enhancement is not inherently oppositional to the goal of continued economic growth and stability. The solution to the environmental threat lies in the utility of the current animal waste produced as an economic resource. This will call for conversion from a waste disposal perception to one of the best resource use. Governor Bill Clinton in speaking to the Animal Waste Task Force said, "I just don't accept the fact that you have to kill the economy to clean up the environment." (Arkansas Gazette, May 28, 1991)

Study Results

Priority watersheds

One objective of the Illinois River Basin study was to develop a system to prioritize watersheds in the basin based on the extent the watersheds are contributing to the degradation of the Illinois River. Initially, the primary focus of the study was agriculture nonpoint source pollution problems. During the course of the study, it became apparent that in some watersheds, nonpoint sources were the only obvious source of the pollution problems; in other watersheds, point sources were apparently the major contributing source; and in some watersheds, both nonpoint and point sources were contributing to the problem.

USDA programs are generally limited to addressing the watersheds with nonpoint source agriculture pollution problems. Both Arkansas and Oklahoma SCS needed a system that identified watersheds with nonpoint source agriculture pollution problems. The SCS priority matrix developed in Arkansas was influenced by the degradation of public water supplies, which is designated as the highest priority beneficial use by law. SCS priorities in Oklahoma are influenced by the effects of pollution on the recreation industry as well as water supplies. Oklahoma State agencies wanted to address both nonpoint and point pollution problems, so they wanted a system that would prioritize the watersheds based on total pollution problems. To satisfy each agencies needs, three different priority systems were developed. Oklahoma SCS developed a system using potential nonpoint source agriculture data, land use, and watershed size. Arkansas developed a system using potential nonpoint agriculture source data, land use, municipal water supply locations, benthic data, and chemical data. OCC developed a system using potential agricultural nonpoint source data and water sampling data.

All agencies first divided the basin into major watersheds and then further subdivided these into smaller watersheds. Area and land use in each watershed were determined from GIS in Oklahoma and by SCS employees in Arkansas. Each watershed was inventoried to estimate human and animal populations and the number and type of confined animal feeding operations. All existing and potential pollution sources were inventoried. Water quality data were evaluated in many of the watersheds.

Many of the water quality improvement projects will be a cooperative effort between several State and Federal agencies. All priority systems will be used to help select watersheds for these cooperative projects.

Each priority system will provide a different prospective of the problems in the Illinois Basin and will allow more diverse groups to address the water quality problems.

A detailed description of each agency's priority system is included in appendix F.

Resource base report

The Illinois River Basin Resource Base Report was prepared to better define the water quality problems of the Illinois River Basin. This report contains in a single document a description of the basic natural, physical, and human resources of the basin as well as data on animal numbers and other factors that can adversely impact water quality. Most of these data were taken from published sources. Land use information and water quality parameters were developed specifically for this study. By bringing together information on the pertinent parameters, the problems of the area can be analyzed and solutions developed. In some instances data that are not available were noted and served as a basis for recommendations as to future action. Prioritization of watersheds based on critical parameters provides a logical sequence to begin a program to reverse the trends toward continued degradation of the water quality of the Illinois River.

Water quality plans for high priority areas

In the second phase of this study plans for Upper Osage and Little Osage Creeks and Clear Creek in Arkansas completed in 1992. Special reports were written for Shell Creek and Ballard Creek in Oklahoma in 1991.

Recommendations

Several opportunities for strengthening the chances of improving the environmental quality of the basin were discovered during the course of the study. The following recommendations are in addition to continuation of the ongoing USDA water quality programs described in earlier sections of this report. The voluntary adoption of conservation practices by producers with technical assistance provided by the SCS, cost share incentives provided by the ASCS, and a strong education and information program by the CES, in concert with other State and Federal agencies is the preferred method of agricultural nonpoint source problem correction and prevention.

Legislation, regulation, and policy

Efforts should continue to support the governor's animal waste task force in Arkansas as a means of coordinating all agency programs and projects and identifying inadequacies, overlap, or conflict in animal waste regulations or guidelines.

A complete review is needed in Oklahoma of existing legislation, regulations, and agency policies to determine areas needing additional legislative direction, updating based on current knowledge and technology, overall improvement, and elimination of duplication. The review needs to include a review of local and State laws and policies to identify problem areas, determine areas where Federal, State, and local programs can complement each other, and improve communication, cooperation, and coordination of all units of government to improve water quality in the basin. This review process is underway in Arkansas.

Ground water study

During the investigation of ground water in the basin, it was discovered that very little data were available on ground water quality with adequate quality assurance and quality control to reach conclusions. A comprehensive study of ground water quality needs to be conducted before any conclusions or recommendations can be made on Illinois River Basin ground water quality.

Continued support of increased ground water monitoring by the CES, the USGS, and State agencies is needed. The Ozark Plateaus NAWQA study should be coordinated with nonpoint source programs where possible to achieve mutual goals.

New practices

One of the goals in most water quality program initiatives is to develop new and innovative practices that improve water quality. If these practices are to be developed and used, funding must be provided for the research and documentation of the practices. The process of approving the practices for implementation must be streamlined. The process of determining cost share assistance eligibility should be more flexible. Training for the technicians responsible for designing and laying out the practices should be continued.

Composting market

Composting poultry litter and marketing it as a soil improvement may be the most promising alternative to the problems associated with spreading it over fields within the basin. Composting technology has been developed to produce an economical, useful, and acceptable soil enhancement product. The principal restraints for this developing industry are the limited market for the product and transportation costs. Financial assistance and technical support from government agencies or animal industries, or both, may be the key to developing this market. Developing this market could be the key to improving the water quality problems in the basin. A limited amount of funds has been made available by the Arkansas Development and Finance Authority to support the development of composted products. This financial assistance should be expanded and concentrated on the development of marketing strategies.

Most existing fertilizer application guidelines and nutrient information were formulated on commercial fertilizers and nutrient deficiencies for forage production, not excessive nutrients as a source of water quality degradation. The information about the effects of continuous high applications of animal manure to the soil and resulting build up of nutrients in the soil is limited. The data on how and in what form nutrients in manure are transported in surface runoff and through the soil profile are also limited. More information is urgently needed on this subject to help develop water quality practices and recommend

timing and application rates for animal waste. The information is a critical part of efforts to improve animal waste related to nonpoint pollution problems. A few animal waste application rate and nutrient runoff studies are in progress, but inadequate funding is delaying progress and limiting the results of the studies. Additional funding to accelerate animal waste application studies and develop needed related practice information should be one of the highest priorities of nonpoint source water quality programs. Innovative ideas to make use of the litter in crop producing areas need to be explored. Backhauling waste in trucks or railcars or developing a barter system among feed growers and animal producers to trade part of resulting improved production for waste are a few of the current ideas being investigated. Subsidizing small trucking businesses to make transporting waste profitable could also be an option. These ideas need to be evaluated and their feasibility documented. Development of economical ways to transport waste could be encouraged by providing incentives and technical assistance.

Plan development

The need for water quality farm plans will continue beyond the time of this study. Plan development on priority watersheds should continue in response to local concerns and needs. The interagency (Federal, State, and local) approach should be used to develop and implement plans using existing programs to the maximum extent practical.

Education

Some of the public, landowners, and operators do not understand the extent of the nonpoint pollution problem, the potential to their operation to contribute to the problem, and sources of available assistance. An intensive educational program needs to continue throughout the basin until a majority of practices, measures, and actions needed to address the nonpoint pollution problems have been installed and implemented. The education program should include all local, State, and Federal agencies along with the involvement of private citizens and industries.

Industrial

Basin residents and governmental agencies need to be innovative in developing and implementing measures to protect, improve, or enhance the quality of water in the basin. Examples of measures could include such components as:

- Evaluation of existing programs, laws, and policies to determine how they can contribute to the improvement of water quality or how the programs need to be modified or expanded.
- Identification of need and development of new programs.
- Establishment of an effective monitoring program.
- Establishment of a governors' (Oklahoma) water quality advisory committee to advise on water quality issues and provide a forum for discussions on economic growth without (or with minimum) effects on the environment. The committee should be inclusive of all groups; industry, private, governmental, environmental.

EPA regulations

Most sewage effluent discharge permits issued by EPA do not limit or require monitoring of phosphorus loads in the effluent. The current permitting method sets discharge limits for municipal sewage effluent by evaluating the effects of the point discharge on a limited area of the stream. The limits are not based on a scientific evaluation of the total effect of all sources of pollution going into the stream system. The method does not account for the cumulative effect of all point and nonpoint source loads being discharged or transported into the stream system. If phosphorus discharge from point sources remains unrestricted or if it is limited using current methods for determining the limit, the total phosphorus load in the Illinois River and Tenkiller Reservoir could continue to exceed eutrophication limits even if phosphorus loads from nonpoint sources are reduced significantly. Phosphorus discharge limits should be included in all point source permits. Phosphorus and other pollutant limits should be determined by evaluating the cumulative effect of all point and nonpoint sources on the stream system. EPA and agencies responsible for nonpoint sources should cooperate in the evaluation process to determine the maximum discharge limits.

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